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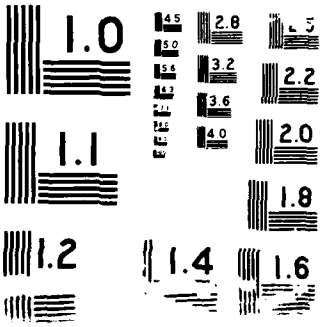
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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Recently, chemiluminescence analysis of low concentration cobalt and chromium in natural waters has enjoyed much success over the more time consuming method of flameless atomic absorption spectrometry (FAAS), which consists of sample preconcentration by solvent extraction followed by FAAS.

New solid-state multichannel array detectors offer greater sensitivity and better performance in many respects over currently available photon counting photomultiplier tubes. These detectors have the potential of greatly improving low light level spectroscopic measurements. In this study, a solid-state, integrating, two-dimensional charge-coupled device (CCD) was used to measure the chemiluminescence spectra and to quantitatively determine chromium, cobalt, and hydrogen peroxide by luminol chemiluminescence.

The RCA SID501EX charge-coupled device used in this study has the desirable characteristics of low readout noise, low dark current, and high quantum efficiency. This quantum efficiency is approximately 55% at the luminol chemiluminescence maximum of 425 nm.

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19. Abstract (continued)

The chemiluminescence was measured using two experimental configurations. One employed a flat field polychromator, and a sample cell to obtain the spectra of luminol-peroxide-metal chemiluminescence. The very low intensity background emission spectra were also measured. The second instrumental configuration consisting of the CCD and a sample cell was employed for quantitative determinations.

Utilizing the integrating capability of the detector to collect the chemiluminescence emission over a period of a few minutes, reproducible sample introduction and mixing is no longer a critical factor. Thus, by eliminating the variation introduced through non-uniform introduction of sample and mixing, excellent sensitivity and reproducibility were obtained.

Femptogram level detection limits for both Co(II) and Cr(III) are the result of low readout noise, low dark current, and high quantum efficiency. The instrument's linear dynamic range is 5 orders of magnitude with 20 µL sample injected in 100 µL alkaline luminol solution.

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Femptogram Level Determination of Cobalt and Chromium by Luminol Chemiluminescence Detected by a Charge Coupled Device

by

Rafi D. Jalkian and M. Bonner Denton

Prepared for Presentation at the
Pittsburgh Conference
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February 22, 1988

Department of Chemistry
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Tucson, Arizona 85721

February 4, 1988

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Index Headings: Chemiluminescence, luminol, 3-aminophthol hydrazide, cobalt (II), chromium (III), hydrogen peroxide, CCD, charge-coupled device, charge transfer device

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